

CONSTRUCTION STANDARD SPECIFICATION

SECTION 15081

DUCT INSULATION

	<u>Page</u>
<u>PART 1 - GENERAL</u>	
1.01 Summary	2
1.02 References	2
1.03 Submittals	2
1.04 Quality Assurance	3
1.05 Delivery, Storage, And Handling.....	3
 <u>PART 2 - PRODUCTS</u>	
2.01 Insulation Materials	3
2.02 Field-Applied Jackets.....	4
2.03 Accessories And Attachments	4
 <u>PART 3 - EXECUTION</u>	
3.01 General Application Requirements.....	5
3.02 Mineral-Fiber Blanket Insulation Application.....	5
3.03 Mineral-Fiber Board Insulation Application	6
3.04 Mineral-Fiber “Pipe And Tank” Insulation Application	7
3.05 Calcium Silicate Insulation Application	7
3.06 Field-Applied Jacket Application	7
3.07 Duct System Applications.....	8

CONSTRUCTION STANDARD SPECIFICATION

SECTION 15081

DUCT INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes semirigid and flexible insulation for ducts, plenums, and breechings; insulating cements; field-applied jackets, accessories; and sealing compounds.

1.02 REFERENCES

- A. American Society of Testing and Materials (ASTM)
 - 1. B 209 Aluminum and Aluminum-Alloy Sheet and Plate
 - 2. C 533 Calcium Silicate Block and Pipe Thermal Insulation
 - 3. C 553 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
 - 4. C 612 Mineral Fiber Block and Board Thermal Insulation
 - 5. C 795 Thermal Insulation for Use in Contact with Austenitic Stainless Steel
 - 6. E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
- B. Military Specifications
 - 1. MIL-C-19565C Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor-Barrier

1.03 SUBMITTALS

- A. Product Data: Submit manufactures product data for insulating materials used that identify thermal conductivity, thickness, jackets (both factory and field applied, if

any). Provide manufactures installation requirements for each type of insulation. Show compliance with necessary industry standards and listing agencies.

1.04 QUALITY ASSURANCE

- A. With the exception of duct liners, all insulating materials required for ducting, plenums, and breaching shall be furnished and installed under this contract. The execution of the work shall be in strict accordance with the best practices of the trade, the manufacture's requirements, and the intent of this specification.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing: Ship insulation materials in containers marked by manufacture with appropriate ASTM specification designation, type, and maximum use temperature.
- B. Insulation materials shall be kept dry and protected from the weather at all times until installation is complete. Insulation material found to be wet or damaged shall be replaced by the contractor at no cost to the owner.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

- A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, for use to 450 deg. F, with a factory-applied jacket manufactured from foil, reinforcing scrim, and kraft paper (FSK). Minimum density of 3 lb./cu.ft., maximum conductivity of 0.40 (BTU-in./hr.-sq.ft.-deg. F) at 300 deg. F.
- B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, for use to 450 deg. F, with a factory-applied jacket manufactured from foil, reinforcing scrim, and kraft paper (FSK). Minimum density of 3/4 lb./cu.ft., maximum conductivity of 0.43 (BTU-in./hr.-sq.ft.-deg. F) at 200 deg. F.

- C. Fiberglass "Pipe & Tank" Insulation: Semi-rigid fiberglass board in roll form. Comply with ASTM C 795, Type II, for use to 850 deg. F with a factory-applied jacket manufactured from foil, reinforcing scrim, and kraft paper (FSK). Maximum conductivity of 0.45 (BTU-in./hr.-sq.ft.-deg. F) at 300 deg. F.
- D. Calcium Silicate Insulation: Flat, curved, and grooved-block sections of noncombustible, inorganic hydrous calcium silicate with a nonasbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
- E. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.

2.02 FIELD-APPLIED JACKETS

- A. Aluminum Jacket: Smooth finished sheets manufactured from 0.024 inch thick aluminum alloy complying with ASTM B209 and having an integrally bonded 1-mil thick, heat-bonded polyethylene and kraft paper moisture barrier over entire surface in contact with insulation.

2.03 ACCESSORIES AND ATTACHMENTS

- A. Tape: Tape for sealing joints in the insulation shall be a minimum of 3 inches wide, pressure sensitive and of the same type material as the insulation jacket it is used on.
- B. Bands: $\frac{3}{4}$ " inch wide, 0.007 inch aluminum.
- C. Wire: 0.008-inch nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.0062-inch, soft-annealed, galvanized steel.
- D. Screws: Stainless steel sheet metal screws
- E. Anchor Pins and Washers; Anchor pins and washers shall be one of the following and shall have a holding capacity of 100 lb. for direct pull perpendicular to the attached surface, and shall have a pin length sufficient for insulation thickness indicated:
 - 1. Weld attached: Copper-coated steel pin for capacitor-discharge welding and a minimum 1- $\frac{1}{2}$ inch diameter galvanized speed washer.
 - 2. Adhesive-Attached: Perforated galvanized steel plate, pin and minimum 1- $\frac{1}{2}$ inch diameter washer manufactured for attachment to duct and plenum with adhesive (Stick pins are not allowed). Adhesive recommended by the anchor pin manufacture as appropriate for surface temperatures of ducts, plenums, and breechings.

PART 3 - EXECUTION

3.01 GENERAL APPLICATION REQUIREMENTS

- A. Coordination and Preparation: Schedule insulation application after sealing and leak testing duct systems. Clean and dry surfaces to receive insulation. Keep insulation dry during application and finishing.
- B. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions: with smooth, straight, and even surfaces: and free of voids throughout the length of the ducts and fittings.
- C. Refer to table at the end of this Section for materials, forms, jackets and thickness' for each duct system.
- D. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- E. Hangers and Anchors: Seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously around hangers and attachments.
- F. Interior Walls and Partition Penetrations: Apply insulation continuously through walls and partition, except fire-rated walls and partitions.
- G. Fire-Rated Wall and Partitions: Terminated insulation at fire/smoke damper sleeves for fire-rated wall and partitions penetrations

3.02 MINERAL-FIBER BLANKET INSULATION APPLICATION

- A. Blanket Applications for Ducts and Plenums: Follow manufactures recommendations for "Stretch-Outs" using a maximum compression of 25%. Duct wrap shall be installed to allow maximum fullness at corners (avoid excessive compression). Secure blanket insulation with anchor pins and speed washers to prevent sagging. Do not over compress.
- B. Apply adhesive to ducts to assist with installation and as required by the manufacture.
- C. On rectangular and oval ducts, install anchor pins and speed washers to the bottom of horizontal ducts 24 inches and larger and all sides of vertical ducts 24 inches and larger:
 - 1. Space 18 inches o.c. each way. Apply additional pins to hold insulation tightly against surface at cross bracing.

2. Impale insulation over anchors and attach speed washers. Do not over compress insulation during installation.
 3. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- D. Insulation shall be butted tightly at joints and vapor barrier facing shall be overlapped a minimum of 2 inches. All seams shall be stapled approximately 6 inches on center with outward chinning ½-inch staples, then sealed immediately with minimum 3 inch wide pressure sensitive tape having the same facing as the insulation. Apply tape with a moving pressure using a squeegee or other appropriate sealing tool.
- E. Apply insulation on duct elbows and transitions with a full insulation segment for each surface. Apply mitered sections of rigid insulation to curved fittings in outdoor ducts.
- F. Apply vapor-retarder mastic or matching pressure sensitive tape to open joints, breaks, and punctures.

3.03 MINERAL-FIBER BOARD INSULATION APPLICATION

- A. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.
- B. Apply adhesive to ducts to assist with installation and as required by the manufacture.
- C. Install anchor pins and speed washers to the sides ducts as follows:
1. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 2. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
 3. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- D. Insulation shall be butted tightly at joints. Cover joints immediately with minimum 3 inch wide with pressure-sensitive tape having same facing as insulation. Apply tape with a moving pressure using a squeegee or other appropriate sealing tool.

- E. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- F. Apply vapor-retarder mastic or matching pressure sensitive tape to open joints, breaks, and punctures.

3.04 MINERAL-FIBER "PIPE AND TANK" INSULATION APPLICATION

- A. "Pipe and Tank Applications for Ducts and Fittings: Secure insulation to ducts with adhesive and lapped seams with pressure sensitive tape.
- B. Insulation shall be butted tightly at joints and vapor barrier facing shall be overlapped a minimum of 2 inches. All seams shall be stapled approximately 6 inches on center with outward chinning ½-inch staples, then sealed with minimum 3 inch wide pressure sensitive tape having the same facing as the insulation.
- C. Apply insulation on round and oval duct elbows and transitions with individually mitered gores cut to fit the fitting. Cover the insulation at the fitting with glass cloth, overlapping the duct insulation by 2 inches and seal with vapor barrier mastic.

3.05 CALCIUM SILICATE INSULATION APPLICATION

- A. Apply insulation according to the manufacture's written instructions and as follows:
 - 1. Secure single layer of insulation to the duct with stainless-steel bands. Tighten bands without deforming the insulation material.
 - 2. Apply two-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch soft annealed, stainless-steel wire. Secure outer layer with stainless-steel bands.
 - 3. On exposed applications, without metal jacket finish insulation with a skim coat of mineral-fiber, hydraulic-setting cement to surface of installed insulation. When dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch. Apply finish coat of lagging adhesive over glass cloth or tape. Thin the finish coat to achieve smooth finish.

3.06 FIELD-APPLIED JACKET APPLICATION

- A. Exterior: Apply aluminum jacketing to all external ductwork that is insulated. Cover all fittings and specialties with aluminum jacketing.

- B. Apply metal jacket where indicated, with 2-inch overlap at longitudinal seams and end joints. Secure jacket with stainless-steel sheet metal screws 6 inches o.c. and at end joints. Overlap longitudinal seams arranged to shed water and seal end joints with weatherproof mastic.

3.07 DUCT SYSTEM APPLICATIONS

- A. Materials and thickness for systems listed below are specified in table at the end of this Section.
- B. Insulate the following plenums and duct systems.
 - 1. Indoor concealed and exposed supply-, return-, and outside-air ductwork.
 - 2. Outdoor exposed supply and return ductwork.
 - 3. Boiler breeching and connector ductwork.
- C. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums, casing, terminal boxes, and filter boxes and sections.
 - 5. Flexible connectors.
 - 6. Vibration-control devices.
 - 7. Testing agency labels and stamps.
 - 8. Nameplates and data plates.
 - 9. Access panels and doors in air-distribution systems.

Duct Insulation Applications

System	Shape	Location	Insulation Type	Thickness	Density	Jacket
Supply, Return, Outdoor Air	Rectangular	Equipment Rooms and Pipe Chases	Insulation Board or Fiberglass Blanket	1-1/2"	3 PCF	FSK
				2-1/2"	3/4 PCF	FSK
Supply, Return, Outdoor Air	Round & Oval	Equipment Rooms and Pipe Chases	Fiberglass Blanket	2"	3/4 PCF	FSK
Supply and Return	Rectangular/Round & Oval	Concealed	Fiberglass Blanket	2"	3/4 PCF	FSK
Supply and Return	Rectangular/Round & Oval	Exposed	Fiberglass Blanket	2"	3/4 PCF	FSK
Supply and Return	Rectangular	Outdoor	Insulation Board	2"	3 PCF	
Supply and Return	Round & Oval	Outdoor	Fiberglass "Pipe and Tank"	2"	N.A.	
Boiler Exhaust	Round	Indoor	Calcium Silicate	2"		Aluminum Jacket

END OF SECTION